Burnett (C. H.)

REPORT

ON THE

PROGRESS OF OTOLOGY.

By C. H. BURNETT, M. D.

READ BEFORE

THE AMERICAN OTOLOGICAL SOCIETY,

AT THE

ANNUAL MEETING,

JULY 16TH, 1873.

BOSTON:
ALFRED MUDGE & SON, PRINTERS, 34 SCHOOL STREET.
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From the Author
127 So. 18th St
Phila.

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BY C. H. BURNETT, M. D., OF PHILADELPHIA.

Your committee, in presenting the report on the Progress of Otology during the past year, takes pleasure in stating that the amount of new work in our department of science is in excess of that of the previous year. I have endeavored to, at least, record the title of every production relating to Otology, in the Bibliography appended to my report. But time has been too short for a careful review of many interesting papers, which are, therefore, simply recorded in the aforesaid list.

We have gained several special works on the Ear, both therapeutical and anatomical, and a new text-book by Prof. Roosa, of New York, is promised by the first of August of this year. The title of this work will be, "A Practical Treatise on the Diseases of the Ear, including the Anatomy of the Organ." It will be illustrated by wood-cuts and chromo-lithographs.

Through the kindness of the author, I have seen the advance sheets of this work. According to the Index, the book will be divided into four parts, as follows: I. Introduction and External Ear. II. Middle Ear. III. Internal Ear. IV. Deaf-Mutism and Hearing Trumpets.

The lithographic plates present very good perspective features; Nos. 1, 5, 6, and 7, I consider especially good. The accuracy of these pictures is brought out by viewing them through a short tube of any kind, but markedly through an aural funnel.

Those portions of the work which treat of mastoid disease, and the operations for their relief, are copious in interest and information.

The latest discoveries in the anatomy and physiology of the organ of hearing, are amply acknowledged, and the

book is enriched by the labor of the modern microscopic-anatomists.

Dr. Roosa's own rich experience is constantly adduced throughout the work, while the labors of others in our specialty are most generously alluded to, thus rendering the work one of widest range.

Foremost among the works on the structure of the organ of hearing are those of Rüdinger on the Labyrinth, and Waldeyer on the "Cochlea and Acoustic Nerve," in the last part of Stricker's Manual of Histology. Both of these papers have been ably translated, with the entire work containing them, in England and America. (Sanderson, Buck, *et al.*)

Dr. Hasse, of Würzburg, has recently published a new work on the "Comparative Morphology and Histology of the Membranous Auditory Apparatus of the Vertebrates, together with remarks on the Comparative Physiology of the same" The work contains two plates. I regret exceedingly that time has not permitted me to give you a careful resumé of the labors of this distinguished author, but I am confident that the new work is in every way commensurate with the industry and reputation of its author.

We have two works on special features of disease of the ear; the first being a treatise on "Tinnitus Aurium," by Delstanche, fils, of Brussels; and the later one on "Progressive Hardness of Hearing," by Weber-Liel (F. E. Weber), of Berlin, both of which are again referred to further on in my report.

From Paris we have a small work on "Diseases of the Ear," by Levi. Its special feature is its adaptation to the requirements of military surgeons. The colored lithographic plates are very good.

We can pronounce the translation into English, of Helmholtz's "Mechanik der Gehörknöchelchen,"— a most valuable work in Otological literature, as well as one which reflects the greatest honor on its translators, Drs. A. H. Buck and Normand Smith.

In a letter dated April 13th, 1873, which your committee received from Prof. A. Politzer, of Vienna, he informs me, that his plates, illustrative of the anatomy of the organ of hearing, would appear by the end of April of this year, under the title of "Zehn Wandtafeln zur Anatomie des Gehörorgans." He further states in this letter that each plate is to be seventy centimetres long by fifty-seven centimetres high, with a proportionate magnification of the various parts of the organs of hearing. Since receiving this letter I understand that these plates have appeared in Vienna bearing the imprint of the publishing house of W. Braumüller.

The amount of literature contributed to our specialty increases so rapidly, and is of such great worth to those interested in our department, as well as to the general practitioner, that your committee would suggest the appointment of two members, instead of one, to perform the work of reviewing and preparing the productions of authors for the annual report. These gentlemen could easily divide the labor, and the Society would thus gain a much more complete compendium of the advance in our science, which would really serve as a manual for guidance in the practice of daily professional life. It is an experience of the past year, which shows that more is being done each month in our specialty, and the consciousness that your committee presents a report far from being as complete as he could desire, that prompt this suggestion, which, if followed, would give scope to the work of your committee, as well as greater information to the members of the Society.

It is with the deepest satisfaction that we have read the reports on the "Progress of Otology," as they have appeared from the pen of Dr. J. Orne Green, in the "Boston Medical and Surgical Journal," and we express the hope that similar reports from the same source may continue to appear.

The report to which I now call your attention, is similar, in its general arrangement, to that presented last year to the Society, by Dr. Blake. It will be my aim to take up each

point in order, endeavoring to give to each a fair but short review. Although many valuable papers are mentioned only in the Bibliography, it is an indication of a want of time, on the part of your committee, to give them a proper review, and not of any want of merit on their part.

Voltolini has offered to the profession a pneumatic aural speculum, which is a compound of Siglé's pneumatic speculum and Brunton's speculum. With this he proposes to investigate more thoroughly and most boldly the middle ear, after cutting away the posterior segment of the membrana tympani and turning it forward over the hammer. He thus obtains a more p rfect view of the fenestræ of the labyrinth and of the stapes. He also proposes to operate with this speculum in situ, by introducing a knife through a slit in the funnel portion of the speculum. He reports one case of tenotomy of the tensor tympani performed successfully by its aid. If the instrument is all the inventor claims it to be, we may consider it a valuable addition to the diagnostic as well as surgical means of otology.

Prof. Voltolini, in the account of the operation for tenotomy of the tensor tympani, performed by the aid of his pneumatic speculum, gives preference to the posterior segment of the membrane as the field for the incision in such an operation, since in that position the surgeon finds more room for movement of the knife. He says, however, that the most important part of the operation, viz the *cutting of the tendon*, must be done unaided by the eye of the operator, who must rely upon a perfect knowledge of the anatomy of the parts concerned in the operation, and his *tactus eruditus*.

Dr. E. De Rossi, Professor in the University of Rome, claims to have invented a binocular otoscope. It is simple and inexpensive, differing very slightly from the original form of Helmholtz's ophthalmoscope. It is so arranged on a forehead-band as to allow the use of both hands, but the distance of the eye from the membrana tympani, necessary to obtain a binocular view (30 centimetres), renders the instrument of no very great practical utility.

Dr. Trautmann has investigated the physics of the concave mirror when used with lenses for the purpose of magnifying the membrana tympani in ordinary examinations. His paper concludes with a list of lenses arranged according to their focal distances, and the distance at which the source of artificial light should be placed.

Voltolini calls attention to an explanation for the formation of the so-called pyramid of light (Licht Kegel) of the membrana tympani. The first indispensable condition for its appearance is a good reflecting surface. But this alone will not produce the "triangular spot of light" so long as the membran is a plane surface, although it may have any inclination to the axis of the external auditory meatus.

Hence, the cause of "the triangular spot of light" is to be found, according to Voltolini, in the concavo-convex form of the normal membrana tympani.

By way of illustration, Voltolini refers to the flower of a convolvulus, or so-called "morning-glory," as a good example of the shape of the normal membrane.

It is at once bell-shaped as well as funnel-shaped. At the centre it is concave; at the edges convex. Hence, the centre, or "funnel," reflects light like a spherical-concave mirror, while the edges act like a convex-spherical mirror. From the reflection of these two mirrors, *i. e.* from the "funnel," results the so-called "pyramid of light." The prominent feature of the explanation is, the assertion that the position of the membrane in reference to the axis of the meatus has nothing to do with the formation of the peculiar reflection in question. The author says this can be produced by taking an ordinary tin funnel, found in every household, and holding the wide-mouthed end towards the window. Then, we should instantly see the "pyramid of light," and we continue to see it, although we may hold the wide mouth of the funnel towards the floor. The "pyramid" will simply be a little fainter in the latter instance.

In a living man, the concavity of the membrane, as a rule, plays the greater part, in the formation of the "pyramid of

light," because the light can rarely pass into the meatus in such a way as to enable us to see at the same moment the reflection caused by the concave and convex portions of the membrana tympani.

Since the concave portion of the membrana tympani receives most readily the light entering the meatus, we obtain its reflection only, and hence see the "pyramid of light" at the under part of the membrane only. The apex of the pyramid is seen at the point of the manubrium of the malleus, and its base at that point where the concavity of the membrane fades into the convexity of the membrane. This is seen in the membrana tympani, removed from the meatus, so long as the funnel shape is preserved.

That the convexity of the membrane in certain positions will produce a "spot of light" is seen in the membrana tympani of the bird, which is convex outwardly. On the prominent hillock thus formed we can see a pyramid of light when holding the meatus of the bird towards the light. In such a case it is manifest that the membrana tympani has a form widely different from the concave membrane of man.

Politzer, in his work on the Membrana Tympani (Beleuchtungsbilder des Trommelfels, 1865), says that the image or reflection in question is the result of the shape of the membrane, produced by traction inwards; that a plane shining surface will not produce it, and that the inclination of the membrane is not the cause of the "pyramid of light." The explanation given then by Politzer is essentially the one now offered by Voltolini.

Zuckerkandl has contributed an interesting paper on the development of the external meatus auditorius. He describes a new point of development in the annulus tympanicus, between the spina tympanica antica and the spina tympanica postica, which he denominates tuberculum tympanicum anticum. On the anterior edge of the posterior limit of the annulus, but deeper down than the tuberculum tympanicum anticum, is another bony process and point of development, which he calls the tuberculum tympanicum posticum.

It is by the development and union of these tubercles that the external meatus is formed, or a defective development of the passage is due to a want of union between these points of bony growth.

Between the 20th and 30th year the external meatus is in its most perfect condition.

Between the 30th and 40th years the meatus may show defects in the bone, which increase with age. Defects of the meatus, which can be traced to arrested development of the os tympanicum, belong to the greatest rarities. Among a thousand cases the author found but two.

The causes of these defects are: —

1. Atrophy of the bone.

2. Pressure of the head of the inferior maxilla, especially in those with defective alveolar processes.

3. Pressure from the head of the inferior maxilla upon the anterior wall of the external auditory meatus, induced by a too great convergence in the articular cavities of the temporal cartilage.

4. In rare cases, persistence of physiological defects occurring during the development of the external auditory meatus.

The attention of the profession has been called, in several instances (Dr. J. Solis Cohen, Phila. Med. Times, No. 79, 1873; Dr. C. H. Burnett, ibid. No. 81, 1873) during the past year to a peculiar irritative cough called "ear cough."

This name has been applied by Dr. C. B. Fox, of Scarborough, England, to a cough caused by irritation of the external auditory canal. He says: With the object of ascertaining the percentage of those subject to this sympathetic peculiarity, one hundred and eight persons have been examined by myself and others under my direction, with the following results: males examined, thirty-seven; females examined, forty-five; sex not noticed, twenty-six; total, one hundred and eight.

Cases in which a sensation of tickling in the throat and cough were occasioned by a titillation of the auditory canal,

twenty-two: cases in which nausea was *alone* produced, three. In one of the cases of irritation of the throat with cough, *nausea* was also complained of; and in another of that number vomiting was said to be sometimes produced. In conclusion, Fox's observations are thus summed up:—

1. From amongst the unknown group of idiopathic coughs, may happily be rescued from obscurity a cough which is excited by an irritation of the meatus auditorius externus in certain individuals.

2. The persons referred to are those who possess a hyperæsthetic condition of the nerve supplying that canal, and in whom any slight titillation of this nerve induces a feeling of tickling in the throat.

3 This hyperæsthetic state generally exists in both ears, sometimes, however, only in one, and occurs in about twenty per cent of those examined.

4. Its existence can usually be traced to childhood, and is probably a congenital peculiarity.

5. The nerve of the ear concerned in the production of ear-cough, is not a branch of the vagus, as Romberg and Toynbee have affirmed, but is a branch of the auriculo-temporal branch of the fifth cranial nerve.

6. This sympathy between the ear and the larynx is an example of a reflected sensation, in which the connection between the nerves involved takes place in the floor of the fourth ventricle.

7. Vomiting is occasionally, but rarely, the result of the application of an irritant to the nerve distributed to the auditory canal.

Dr Denton, who assisted Dr. Fox in his examination of patients, found in one case (a woman twenty-four years old) that vertigo alone was produced by a titillation of the external auditory meatus. In another case, a woman about thirty years of age, tickling in the throat, cough, and nausea were produced by an irritation of the left ear "whilst vertigo was only experienced when the right ear was experimented on."

Dr Denton says that neither of these women was hysterical, nor in a fanciful nervous condition. He believes them to have made thoroughly reliable statements.

Dr. Dobell, in his new work on "winter cough," says that he can confirm the statements of Dr. Fox, from personal observations.

Brown-Séquard, in a lecture "On the Origin and Signification of the Symptoms of Brain Disease," delivered in the amphitheatre of the University of Pennsylvania, on the evening of October 10, 1872, said that othæmatoma has a nervous origin. This variety of tumor is the result of disease at the base of the brain, and is usually found in the paralysis of the insane. It may be produced artificially in animals, and this he has done in less than one night, between the hours of ten in the evening and six o'clock in the morning. He has performed the same experiments, and kept the animal *under his own eye*, until the artificially produced tumor made its appearance. This he accomplished by an irritation applied to the restiform body, on the side corresponding to that of the tumor. In these cases the process thus excited in the ear may pass rapidly into gangrene, so powerful is the effect of the irritation of the restiform body. The lecturer also drew attention to the fact that tumors (othæmatoma) usually occur, in the insane, on that side corresponding to the affected side of the brain, which proves that they cannot be, at least not always, the result of violence on the part of the patient or his attendants; since violence of any kind would not, invariably, be applied to the side of the head nor the ear, corresponding to the affected side of the brain.

Another valuable paper on this subject is one entitled hæmatoma auris, by W. Yeats, M D., of the Coton Hill Institution for the Insane, England. This paper contains a short history of valuable articles on the subject by other authors.

We are informed that the cartilage is the seat of the affection, and hence the lobule of the ear always remains intact. A

good description of the symptoms is given, which will aid in forming a correct diagnosis. The natural course of the disease is rapid. It is usually developed in from four to six hours, which statement agrees fully with the experimental observations of Brown-Séquard. The tumor fades away in a week or ten days, although it may last one month. The blood is effused between the cartilage and the perichondrium, and may then become organized into a hard tumor, which at "last shrivels up and leaves the ear with a puckered appearance." According to the writer of the article under consideration, hæmatoma auris is not prejudicial to hearing; but may, in fact, render it sharper, as in the case of one of the patients in the Coton Hill Institution. This disease is not confined to any peculiar form of insanity, although it is frequently found in dementia. The author distinctly says it never occurs in the sane. The prognosis of mental recovery in those affected with this malady is extremely unfavorable. The author knows of but one case, and this he relates as occurring in his own practice. The patient, a married female thirty-three years old, was admitted to the aforesaid institution, for insanity. Thirteen months after her admission, in the midst of every variety of bad symptoms, hæmatoma auris appeared, and after running its usual course, disappeared. Finally the patient began to manifest symptoms of mental recovery, and in the month of February, 1873, was discharged from the asylum perfectly restored in mind, after three years of insanity.

Prof. Ludwig Meyer, in an article referring especially to Darwin's idea, that the common, small projections in the helix of the ear are remnants of the pointed ear of certain Simian races, says that too much importance has been attached to the deviations in the form of the concha, — much more, in fact, than the unimportant physiological functions of the organ justify.

It has already been noted by previous observers that malformations of the external ear are found in the greatest

number, in connection with arrested development in the region of the first (Kiemenspalte) branchial fissure, viz. with cleft palate, and other forms of retarded development in the bones of the head and face. The explanation of Virchow, that these changes are due to inflammatory processes in the earlier days of fetal development, seemed sufficient to Meyer, until, as he says, he instituted a careful examination of the form and position of the external ear, in a number of insane people, manifesting those peculiarities described and called by him cranium progenicum. In all these cases there was a relative arrest of development of the bones of the face, especially a malformation of the inferior maxilla, and it should be borne in mind that the inferior maxilla is formed through ossification in the membrane of the branchial arch. (Kiemenbogen.) The expectation of finding, in just such cases, characteristic forms of the ear, was not realized, and the theory appeared the less tenable, the further the investigation was extended to numerous cases of both the insane and the sane. Pathologically, the result of the investigation is considered by Meyer to be unimportant, but he expresses a belief that the significance of the form and position of the external ear is purely of a physiognomical character.

In connection with a beautiful, well-formed face, we usually find a round, well-formed, small, and close-lying ear, whereas, in macrocephalic heads we find large massive ears, in some cases real elephantine ears, while the narrow ear, directed backwards, the so-called Faun's ear, accompanies a low, retreating forehead, sharp nose, and narrow chin. A comparative examination of normal male heads seems to indicate that the position of the ear possesses a certain and constant relation to the architecture of the skull; for female heads, with a good facial angle, show a more vertical position of the concha, whereas these relations are altogether different in females and in children.

In women and children we often find, in connection with a large facial angle, obliquely placed ears, so that the upper

part of the helix points backwards, and the posterior portion is directed downwards. The cause of this is to be sought for in the relation of the *ramus* to the body of the inferior maxilla, rather than in the relations of the superior maxilla and the frontal bones to each other. The explanation of the connection between the position of the ramus of inferior maxilla and the external ears is to be referred to the development of those portions of the face from the same part of the (Kiemenbogen) *branchial arch*. Not only the position of the ears, but the elevations and depressions of the auricle, vary even in the same individual.

Comparatively frequent we find irregularities in the edge of the helix. To one of these, more prominent than the others, Darwin has attached the significance already alluded to. Now, the edge of the helix is rarely completely smooth, and even when any slight inequality of the concha escapes the eye, the finger can readily detect it. These are really deficiencies and not absolute prominences, and the wider the loss of substance in the helix cartilage, the more prominent will the remaining portions appear.

If, in an ear where one or two such prominent remnants of the helix occur, a line be drawn joining them, it will correspond with the outline of the normal helix. That these prominences are nothing more than remnants of the helix, is proven by the fact that their inclination, curve, etc., correspond entirely with the curve of the helix.

That part of the helix which affords the most examples of the peculiarity referred to by Darwin is most adapted to producing the longest points, since it is the widest portion of the curved helix. These changes in the ear are doubtless not produced during life, but are congenital. They are found in perfection in little children, and are more apt to occur in males than in females. According to Kollman the helix is not a separate point of development. The auricle consists originally of those formative parts which can be distinctly recognized at the end of the sixth week of fœtal life,

as tragus, antitragus, and anthelix. From the latter the helix is developed. Hence we see that as interferences in the development of the tragus may cause the presence of a cleft in it, so may disturbances in the development of the anthelix cause deficiencies in the helix.

Voltolini contributes the account of another foreign body impacted in the ear, removed by means of galvano-caustic. By employing this means we have a ready way of breaking up the foreign body, and thus facilitating its escape. When a foreign body is wedged in the meatus, the swollen walls tend to push it out, but the body itself, having swollen, cannot escape by the way it entered the ear; therefore it must be made smaller before it can be extracted with comfort or safety to the patient.

By removing portions from the centre of the foreign body, the outer surfaces will approximate, *i. e.* the whole mass will become smaller, and the swollen walls of the meatus will then tend to push it outwards as already stated.

The forensic aspect of traumatic rupture of the membrana tympani has been treated by Prof. Politzer. In this connection there are two points to be considered: —

First. Is there any injury of the membrane present, and if so has it been induced by the asserted cause?

Second. Is the injury trivial or important?

The usual method of producing the injuries in question, is by an ordinary "box on the ear," and if the case is examined soon after the blow, we may detect the injury, if it exists, and pronounce upon the cause which has produced it. As a rule, the wound produced by a blow on the ear gapes constantly, and is usually found in the postero-inferior portion of the membrane. The shape of the opening may be either round or oval, the latter with its long axis parallel with the radial fibres of the membrane.

Most of the traumatic ruptures of the membrana tympani are harmless in their effects. No treatment excepting protection by cotton from cold air, is to be applied to the ear.

In very rare cases the injury may produce a suppuration in the middle ear.

If the injury is uncomplicated with a concussion of the labyrinth, the recovery will be complete.

F. E. Weber-Liel has at last published his long-promised book containing his highly original ideas on the Eustachian tube, its muscles and fasciæ, and the part they play in "progressive deafness." His book contains two hundred and five pages, with six wood-cuts, and four lithographic plates. The work is divided into introductory remarks on disturbances in motility of the muscular structures of the pharynx and Eustachian tube. The latter elements the author considers as the essential and continued causes of the production of the most extensive form of progressive deafness. The first chapter treats of the symptoms and course of this form of disease. The second part of the work treats of the pathogeny of the disease, and is divided into three heads, as follows: —

A. Anatomical relations of the Eustachian tube and its muscles to the tympanum.

B. The physiological relations of the described parts in their connection with the apparatus of the middle ear.

C. Analysis and explanation of the form of deafness, under consideration, based upon the anatomical and physiological facts given.

The third part treats of the ætiology and the pathological conditions.

Fourth part contains the treatment; and the fifth and last part contains histories of cases.

In the introductory remarks the authors says that "he is forced to conclude that the present theory concerning the nature and the origin of the most frequent and important disturbance of the hearing is incorrect." While admitting that almost all deafness, with its accompanying subjective manifestations, may be referred to chronic affections of the middle ear, he is unwilling to admit that all affections of the mid-

dle ear are of a catarrhal nature, and hence rejects the name, "dry or chronic catarrh of the middle ear," entirely as a false denomination.

Weber-Liel's views may be thus summed up, viz. that not only primary and secondary affections of the mucous membrane of the middle ear, but also diseases of its muscles and bones, and especially diseases of the nerves supplying it, may produce a long series of the most dangerous forms of progressive deafness with all its peculiar subjective symptoms.

Among the most fruitful sources of such affections, he mentions neuroses of the trigeminus, disturbed functions of the sympathetic us, the vagus, the glosso-pharyngeus, the facialis, the auricularis magnus, and accessorius nerves. Spinal irritation in females, as well as disease of the naso-pharyngeal mucous membrane, may also complicate a disease of the ear. In the latter part of the introduction, the author says: We must also bear in mind how many affections of the middle ear, which are placed among acute and chronic affections, are really of a rheumatic nature, and appear with such affections in other parts of the body, or substitute them. Since the author has marked out a new theory of diagnosis, he has therefore sought a new method of treatment, and has obtained very satisfactory results, by the use of both constant and interrupted electric currents, applied to the muscular and nervous structure of the throat and Eustachian tube. All of the author's ideas are exceedingly instructive, and at the same time we must bear in mind that he is treating of the most opprobrious subject connected with the practice of Otology.

Dr. C. H. Burnett has published notes on three cases of ear disease where relief was obtained by the use of the knife. Two of these cases were of progressive deafness, one with synechiae of the membrana tympani, attended with simple retraction of the membrane. In the first case, incision through the synechiae, and in the second case incision through

the posterior fold of the membrane (according to Politzer), caused marked improvement in hearing.

In the same article, Burnett reports a case of acute suppurative inflammation of the middle ear, speedily relieved and entirely cured by paracentesis of the membrana tympani, at the postero-inferior segment.

Dr. Burnett (10) has also published the results of further investigation into the comparative distribution of blood-vessels of the membrana tympani, with the following conclusions: —

1. There is a distribution of blood-vessels in the human membrana tympani peculiar to man.

2. There is a distribution of blood-vessels in the membrana tympani of the dog, the cat, the goat, and the rabbit, constant in, as well as peculiar to them.

3. A distribution of blood-vessels exists in the membrana tympani of the Guinea-pig peculiar to it.

Prof. Gruber has written an article on the choice of the point of incision in the operation for tenotomy of the tensor tympani. He alludes to the great services of F. E. Weber-Liel, connected with the introduction of this operation into otological surgery, and while agreeing with him that usually the incision in the membrana tympani may be made in front of the short process of the malleus, says that in some cases the incision can be made more advantageously behind the handle of the malleus, for in this position the tendon can be more readily reached than from a point in front of the malleus. His reasons for these views are as follows: The rostrum of the semi-canalis musculi tensoris tympani varies in its position in the tympanum, being sometimes over the anterior segment of the upper arch of the oval window, — or it may be over it, — and in some cases it may be over the posterior segment of the oval window. The direction of the tendon as it passes from the rostrum cochleare to the handle of the hammer must vary greatly according to the position of the former bony process, and accordingly the handle of the hammer

in cases of retraction will have a variable appearance. If the rostrum cochleare is placed far backward, the hammer will appear driven more backward and inward than if the aforesaid rostrum is situate farther forward, then the handle of the hammer will appear to be drawn directly inward. In the latter case the anterior segment of the membrana tympani will not appear to be so large as it does in the former case, where the handle is apparently drawn far backward and upward. Hence, Gruber concludes that no po-itive rule can be established respecting the choice of a point for incision, most likely to reach the tendon of the tensor tympani muscle; but the variable relations in the membrana tympani, and especially the position of the manubrium of the malleus, must aid us in deciding where the incision should be made.

Carl Frank, of Würtemberg, has performed tenotomy of the tensor tympani, with some modifications of the method recommended by F. E. Weber-Liel, the inventor of the operation.

Frank's first step, especially in a narrow meatus, is to make a free incision from the short process of the malleus to the umbo. Through this opening he inserts his tenotome, somewhat different from Weber-Liel's instrument. The hook of the blade is passed behind the tendon, and the tendon is severed by turning the hook-blade forward.

Rüdinger has published a sketch of development of the bony canals in the neighborhood of the um. tympani.

He first alludes to the formation of the carotid canal, and then the canalis Fallopii. He promises a large work at no distant day, which will treat of the development of the canaliculus chordæ, canaliculus tympanicus, c. mastoideus Arnoldi, the bony portion of the Eustachian tube, and the semi-canalis tensoris tympani.

In the meeting of the Berliner Mediz. Gesellschaft, July 5, 1873, Erhard spoke upon the worth of operative interference in diseases of the cavum tympani. He stated that this cavity contains only two factors of importance, viz. a

delicate isolated membrane connected with a heavy, isolated, vibratile staff (Stab.), *i. e.* the chain of ossicles. The two together form only two anomalies in disease, viz. defects in the membrane, and insufficient isolation.

Topographically, the cavum tympani is higher than the membrane, and the staff already alluded to swings above the latter out of sight. In its condition of mobility it is sustained by the membrane. Hence, after otorrhœa, defects in the membrane alter the position of the staff; want of air in the cavity of the tympanum produces a similar defect. In the first instance, we may replace the chain of bones by means of a falsely, so-called, artificial membrana tympani. In cases of sudden hermetical closure of the tympanum, we overcome the consequent collapse of the membrana tympani by blowing in air, or by means of an incision in the membrane. Disturbances in the drum are often of a mechanical nature, without cellular changes, and are caused by a want of air in the cavum tympani. Hence, sneezing, gaping, etc., often relieve suddenly deafness of many years' standing. Therefore, when this deafness is ascribed to a collapse of the membrana tympani, and an incision is made into it for the purpose of relieving it, relief may be obtained, but simply because we have opened the cavity of the tympanum to the entrance of air. The same thing occurs when we cut through certain folds in the membrana tympani, which folds are also present when the hearing is normal. If the collapse has led to adhesions between the membrana tympani and the walls of the tympanum they must be overcome,

These statements of Erdhard call to our minds the labors of Politzer in this field of Otology. He has performed the operation of cutting through the posterior folds of the membrane, and at other points, for anomalies in the tension of the membrana tympani, not only with great success, but also to him belongs the originality of their publication.

A case of malignant disease of the naso-pharyngeal cavity, which had progressed so far as to injure the hearing on the

left side, is reported by Voltolini. This impairment of hearing had been attributed to "a cold in the head," until the rhinoscope revealed the true cause of disturbed function. The major portion of the malignant growth was removed by the galvano-caustic; but infiltration of the pharynx had already set in, and the patient died on the eleventh day after the operation, and seven weeks from the time the patient first noticed change in the condition of the naso-pharyngeal mucous membrane, and the altered function of hearing.

The author closes his article with the following words: "Can the mouth of the Eustachian tube be entirely closed where the patient retains still the ability to hear a watch a distance of one inch, or should we expect in the case of such a closure complete deafness? I believe the tubal opening was entirely closed, for I was never able to see the mouth by the use of the rhinoscope, and furthermore we might conclude in a case of such great morbid growth, *a priori*, the mouth of the Eustachian tube was closed. I am, therefore, forced to conclude that complete deafness can only occur in a lesion of the labyrinth, and not *in any case* of closure of the Eustachian tube, of adhesions in the external meatus or cavity of the tympanum, or in a destruction of the membrana tympani."

In some cases of so-called dry chronic catarrh of the middle ear, Lucæ recommends a few drops of a solution of choral hydrate (1 : 30), introduced into the middle ear by means of the Eustachian catheter and the air douche. Then generally follows a severe but short reaction. In the best cases, after the second application, an improvement in the hearing is noted. If no improvement is seen after the twelfth application, we may expect none from the use of this remedy. In ten per cent of all cases the improvement was marked; in twenty-five per cent, slight; and in sixty-four per cent, no improvement occurred.

Dr. Seyfert, of Odera, has written a continued paper on the "Various Applications of the Irrigation Apparatus."

In it he alludes to the use of that form of the apparatus known as the "nasal douche." Its discovery he attributes to E. H. Weber, while that investigator was making his experiments on the organs of smell.

Theo. Weber, of Halle, was the first to utilize the fact that a stream of water passed through one nostril will escape through the other, after passing through the naso-pharyngeal space. This is due to the well-known reflex effect upon the velum palati, causing it to retract, and shut off the naso-pharyngeal space from the pharynx. Dr. Seyfert lays down three leading principles, to be observed in the application of the nasal douche: —

1. The vessel containing the fluid to be injected must not be higher than the forehead of the patient.

2. The forehead must not be inclined forward too greatly, for if it be the fluid enters the frontal sinuses.

3. The fluid used in each case must be tepid, and in bad weather the patient should not leave the room for one quarter of an hour after the use of the douche.

Dr. Seyfert says that he has never known a case of secondary inflammation to occur when these rules have been observed. The writer alludes to the fact that Profs. Moos, Knapp, and Roosa have written in unfavorable terms of the use of this means of treatment; but as he has seen numerous cases of the use of the nasal douche in the clinic of Prof. Wendt, in Leipsic, without any accidents, he thinks there must have been some error in its use in the case related by Prof. Roosa, in Vol. 1 of Moos and Knapp's Archives, especially in regard to the height of the vessel above the forehead. Everything in such cases depends upon one point, according to the writer, viz. the hydrostatic pressure. If the vessel is higher than the patient's forehead, the error may be vital.

Prof. Gruber does not pronounce positively against the nasal douche of Weber, but thinks it may be on *a priori* grounds less safe than his method of applying medicated fluids to the nares, by direct syringing.

If his method is used, the surgeon can more readily control the force of the injected fluid, which can be augmented sufficiently to throw it into the tympanum or mastoid cells, or applied so gently as to reach only the naso-pharyngeal space. Another point of great difference between Gruber's method and that of Weber is, the interrupted stream of the former. This interruption of the stream allows the patient an opportunity of noticing the condition of the ears.

In Gruber's method, only two fluid ounces are injected at once, which small quantity can be injected with greater or less vehemence according to need. Gruber always examines the membrana tympani after the application of the douche. Since the injected fluid always manifests its effects very distinctly upon the membrana tympani, it furnishes us with an index of the amount of irritation and reaction to be looked for.

The air douche should be used immediately after the application of the fluids by the syringe, if their effects are to be modified in the tympanum, for the air will displace some of the fluids and neutralize their effects.

We now come to the consideration of mastoid disease, a subject which claims more attention each year, and to the pathology, diagnosis, and treatment of which the most valuable contributions have been made during the past year.

Dr. Samuel Ashhurst has published an account of a chronic purulent discharge from both ears, ending in disease of the mastoid cells and other cranial bones, the occipital, temporal, and parietal bones being extensively diseased. The disease dated back to 1868, when the patient was twelve years old.

He was admitted to the Episcopal Hospital, in Philadelphia, in September, 1872, for "vomiting, diarrhœa, and a swelling behind the right ear." The man was placed in bed and closely watched. Pulse and temperature continued high until October 13th, when the temperature fell to 95° F.

On October 20th the symptoms became graver, pulse and temperature very high, and congestion of the skin, confined

to left half of body and right leg, became very marked. This congestion continued well marked during life. Convulsions on the 2d of November, and death on the following day.

Since the 9th of October, or nearly one month, a discharge had been kept up from an opening in the scalp. On the 2d of November, the day preceding death, the necrosed bone was trephined with a small crown. A cessation of convulsions ensued, and the pupil became normal, although the discharge of pus from beneath the bone was very slight, at least, so far as could be detected midst the great infiltration of all the parts by pus. Dr. Ashhurst says: The post-mortem examination was made the day following the death of the patient. The membranes of the brain were very moderately injected on their posterior half. The occipital, temporal, and parietal bones were found to be extensively necrosed.

The disease was limited externally to the inferior angle of the right parietal bone, and to the temporal bone. Internally, it had invaded the occipital bone in the region of the right lateral sinus, considerable erosion and excavation having taken place there, which extended forward to the under surfaces of the petrous portion of the temporal bone, and in this locality two perforations, about one quarter of an inch in diameter, had penetrated to the exterior of the skull; patches of superficial erosion were noticed upon the parietal and temporal bones, stained and slightly roughened. Externally, the inferior angle of the parietal bone had undergone exfoliation, as was also the case with the squamous portion of the temporal bone. The mastoid process was extensively eroded, especially at its upper part, where the perforations were situated.

Dr. Ashhurst's reasons for trephining the bone at the point chosen, were the already diseased condition of the bone, and the inference drawn by him that the lateral sinus was displaced and filled with coagula.

In conclusion, Dr. Ashhurst says: The specimen affords an illustration of how easily a trephine may be applied to a

diseased external table and yet miss an internal abscess. Had I known of the existence of the large perforations revealed in the specimen, no operation would have been undertaken, as mechanical compression could hardly have existed. It is certainly remarkable that with such extensive disease of the bones, there should have been so little meningitis.

Through the kindness of Dr. Ashhurst, Dr. Burnett exhibited to the society the pathological specimen of the cranium furnished by this case.

The specimen is in the cabinet of the Episcopal Hospital of Philadelphia.

Dr. G. C. Harlan reports a case of fatal otorrhœa, in a female twenty-one years old. The discharge had existed for many years, — in fact, since childhood. Great pain and tinnitus aurium occurred about a month before the fatal termination of the disease. Twenty-two days after the first symptoms of pain, a copius discharge of pus occurred from the meatus, and from an incision which had been made over the mastoid process. After this, the pain and tenderness in the meatus disappeared. But violent pain in the forehead, temples, and top of head was complained of, attended by nausea, vomiting, and insomnia. The woman died thirty-six days after the initial symptoms. The post-mortem examination revealed a large abscess filled with more than an ounce of greenish pus, in the middle lobe of the cerebrum, on the left side, resting on the os temporis. The membranes were perforated.

"The temporal bone was removed and macerated for further examination. It was then found that nearly one half of the roof of the tympanum, from the entrance of the Eustachian tube backwards, was destroyed."

The opening from the tympanum to the mastoid cells was very much enlarged, and the upper wall of the horizontal portions of the cells was carious, and contained several large holes. The upper and posterior wall of the bony meatus was "honey-combed," and several small openings communicated

with the mastoid cells. *The mastoid process was very imperfectly developed, and the vertical cells were not formed.*

In a case of disease of the ear, followed by abscess of the brain, related by E. H. Clarke, of Boston, the chief point of interest is the rapid occurrence of brain disease after the acute ear disease. The diseases of the ear producing abscess in the brain are usually of a chronic nature.

Other points of interest are: "The existence of so large a lesion in the brain without marked derangement of sensation and motion," and the slow and intermittent pulse, caused probably by the pressure of the abscess on the medulla oblongata.

Mr. John Wilkins reports two cases of inflammation of the lining membrane of the mastoid cells, with suppuration. He perforated the mastoid wall with a knife, and success attended the operation. In most cases of this nature, the knife would prove a dangerous instrument for perforation, from the liability, engendered by its shape, to perforate the cranial cavity.

Dr. A. H. Buck has contributed a very valuable treatise on diseases of the mastoid process, their diagnosis, pathology, and treatment. The diseases of the mastoid process, according to this author, may be recognized under the following forms: —

1. Inflammation of the external periosteum.
2. Simple congestion of the mucous membrane.
3. Congestion and filling up of the cells with a reddish, pulpy material.
4. Chronic subacute inflammation of the mucous membrane, with sclerosis or hyperostosis.
5. Caries, with accumulation of pus, within the mastoid process.

Dr. Buck gives a very interesting account of a large number of cases illustrative of this disease, and a statistical note of sixty-seven cases, in which mastoid disease was shown to be present. Thirteen cases occurred in children under ten years of age; twenty-six in persons between the ages of

ten and twenty-five: nine in persons between ages of twenty-five and forty; twelve in persons between ages of forty and fifty-five; seven in persons between ages of fifty-five and sixty. The youngest patient was eight months old; the oldest, sixty-two years.

More than half of the patients were under twenty-five years of age. Six of the cases belonged properly to the third form, two were doubtful (third or fifth), and the remainder belonged to the fifth. Of the entire number, three terminated in a spontaneous recovery; twenty-two were operated upon and recovered; eight were operated upon and died; and the remainder, thirty-six in all, terminated fatally. All the cases of spontaneous recovery occurred in persons under sixteen years of age. In performing the operation of trephining the mastoid process, the author gives the following steps: —

A free vertical incision should be first made through the integuments and periosteum of the mastoid bone. The condition of the bone should then be noted. If it be soft or roughened, an attempt should be made to break through the outer lamella by firmly pressing upon it with the end of a steel director. If pus be found between the periosteum and the bone, search should be made with a bent probe for a sinus through which the pus may have found an escape from the mastoid cells. If such a one can be found, apply the drill or trephine at this point, and simply enlarge the existing opening. If no opening be found, dissect up the periosteum from that portion of the mastoid process which is situated immediately behind the external auditory canal, and apply the trephine or drill at a point a quarter of an inch distant from the canal, and a little below the level of its upper wall. The only danger connected with the operation is that of wounding the lateral sinus.

The drill should be rotated in a direction inwards, forwards, and a little upwards; that is, nearly parallel with the canal. The depth to which the instrument should be carried will vary in different cases. The aim should be to reach the

peculiar cell structure of the mastoid process. Ordinarily the fragile cell-structure will be found at a depth of a fifth of an inch. The drill can then be withdrawn, and the steel director used to break down the bony septa.

In the interesting paper upon the artificial opening of the mastoid process, by Schwartze and Edysell, of Halle, we find the history of the operation carefully treated. It appears that Jasser was not the first surgeon who trepanned the mastoid process, although the operation bore his name for a long time.

According to Forget (L'Union Medicale, 1860, 52), T. L. Petit was the first surgeon who performed this operation. Since his time the operation has been successfully performed abroad, and very recently it has been both successfully performed and most carefully written upon by Dr. A. H. Buck, of New York city.

(Archives of Oph. and Otol., Vol. III, No. 1, 1873.)

Petit performed this operation before 1750, upon the mastoid process, which resulted in recovery. The first was done with a hammer and chisel; the second one with a perforator.

The historical part of this paper is full of interest, but the author's lament, that the literature on this subject has been neglected, is well founded. The conclusion drawn by the writer is, that the perforation of the externally healthy mastoid process is not so trifling as some have imagined.

In the second portion of this valuable paper, the anatomy, physiology, and pathological anatomy are carefully treated. The wood-cuts representing various sections through the mastoid cells, are beautifully made and filled with instruction. In concluding this part of the paper we find these words: Since in very many cases nature alone cannot produce a cure, and since, on the other side, the person afflicted with a constant purulent inflammation of the mastoid cells is always exposed to the danger of falling a victim to a severe consequential disease, the necessity of operative interference has been recognized for a long time. In alluding to the means for performing the operation, the authors say, that in

most cases the outer shell of the skull offers no great resistance to perforation. All kinds of instruments may be and have been used with success, but the authors of the paper under consideration give the preference to the gouge.

The gouge is preferred because it is applicable on most surfaces, makes less injuries to the adjacent parts, and even accomplishes all that is desired, even in those cases where, in consequence of sclerosis or hypertrophy of the bone, extraordinary difficulties are presented to the operation. By the use of the gouge, the mastoid antrum can always be found, even where the usual air cells of the process have disappeared.

Since the former is rarely, if ever, wanting, the boring instruments are condemned because the small pieces of bone, or "bone-dust," which they produce, are very apt to be worked into the Eustachian tube, and become imbedded at the isthmus, especially in those cases where the membrana tympani is imperforate. We can only say that as a rule no case would seem to require perforation of the mastoid process where neither nature nor art had perforated the membrana tympani. Among other disadvantages of borers, is the small opening which they in the end, make. This does not allow the proper amount of irrigation; and hence, when these instruments are used, the author thinks he has found a greater tendency to erysipelas and absorption of pus. Therefore trepan-crowns are more useful than borers, because they make a larger opening. It will be borne in mind that Buck recommends the use of a borer to a certain extent, and then a use of crowns, or gouges, to widen the opening the pyramidal borer has commenced. Such a procedure would surely obviate the necessity as well as the danger of going too deep with a pyramidal borer.

Dr. E. Politzer communicates a case of simple catarrh of the middle ear, which presents some rare features. There was a total want of perception of sound, both by the way of the external meatus and the bones of the head, which is explained by Politzer as arising from the pressure of a mass of

mucus upon the base of the stirrup, which caused a temporary paralysis of the terminal branches of the acoustic nerve. By the use of Politzer's method of inflation, the hearing power increased partly, and the author therefore advises us to defer all conclusions drawn from the use of the tuning-fork until we have made a complete investigation of the external and middle ear.

Dr. O. D. Pomeroy, in a record of cases of diseases of the ear, has shown the beneficial results of strong solutions of nitrate of silver, as suggested by Schwartze. In several cases, Pomeroy has used a saturated solution of this salt with advantage.

James P. Cassells has contributed a very interesting and useful paper on the treatment of exanthemal catarrh of the tympanum, in which he has shown the importance of accurate diagnosis and prompt treatmeat in those cases where exudation collects in the tympanum, but does not burst through the membrana tympani. The cases treated by the author were of scarlatina, in which the ear disease was not fully developed until the exanthemal disease had disappeared. In those forms without perforation both chronic and acute, the writer advises paracentesis which he has used with great success. In the acute cases the discharge usually ceases soon after the paracentesis. In the chronic forms the discharge may be very tenacious, and only extracted by syringing the tympanum per tubam.

The author ascribes a peculiar diagnostic appearance to the chronic form of disease of the tympanum after scarlatina.

Dr. Jacobi communicates the histories of fifteen cases, in which he has successfully used the galvano-caustic for the destruction of polypi and granulations. The method is recommended in those cases where the snare cannot be used.

Dr. Ogston has contributed the result of observations made upon two hundred and twenty-nine cases of variola, in these words: In variola, the structures of the ear are not affected.

It appears, therefore, that although the external meatus and the pharyngeal opening of the Eustachian tube may be affected with the pustules of variola, the specific changes do not occur in the deeper parts of the structures already mentioned, nor in the cavity of the tympanum. In one case Wendt found the labyrinth strongly hyperæmic. It must be borne in mind that the last-named part has rarely been investigated in cases of variola. These results are in accord with those gained by Dr. Wendt, of Leipsic.

Dr. Ogston has also contributed a case of rupture of the membrana tympani in a man who had been hung. The rupture is described as ragged, and running from the end of the handle of the hammer downwards. The edges were turned outwards; there was no blood, nor any other fluid in the middle ear.

Prof. Politzer, in a short paper, speaks again of "pedunculated bodies" found in the human middle ear, and first described by him. Later investigations have shown him that the two forms, round and triangular, which he heretofore found separate, may occur in the same individual, and also the same peculiar bodies may be found on the membrana tympani; but this is of rare occurrence.

From the same source we have a paper on "Vascular Alterations in the diseased lining membrane of the Middle Ear."

The venous blood-vessels of the mucous membrane of the cavity of the tympanum, in cases of inflammation with perforation, are especially discussed. Increase in number and size, and great tortuosity, characterize the original vessels; new vessels may also form, in which the walls are thickened and permeated by a granular exudation, and are also stained by pigment. The lymphatics also manifest changes in the form of *cul de sacs*, and lobular projections. The epithelium also appears infiltrated by a fine granular mass and small fat-globules.

In an article on emphysema produced by the introduction of air into the middle ear, Voltolini has demonstrated the

true cause of its occurrence. He says that after the introduction of a probe or bougie into the Eustachian tube, no air should be immediately forced in, because the mucous membrane has most likely been lacerated. He also discards entirely the use of the air-pump, or any means more powerful than the hand-balloon.

The cause of death in emphysema produced by the air-douche, is apparently due to pneumo-thorax. Voltolini proved this to be the cause of death in a dog, into whose naso-pharyngeal region he first introduced a catheter, then a wire, by which he wounded the mucous membrane of the parts near the opening of the Eustachian tube. By a powerful introduction of air he produced sudden death, and a post-mortem examination of the animal showed that air had entered the pleural sac and produced collapse of the lungs. There was no emphysema of the vocal cords nor of the larynx.

Several incisions in the membrana tympani, mostly in directions forming acute angles with the manubrium of the hammer, have been made by Gruber in cases of primary or chronic over-tension of the membrane with asserted success in removing tinnitus and in improving the hearing. The operation is simple and painless, and after all inflammatory symptoms have subsided, generally appears useful.

This method is but the application of an operation described and performed by Prof. Politzer some time ago in the Wiener med Zeitschr, 71, 20.

J. S. Prout has performed myringectomy upon a lady affected with progressive deafness and adhesions.

The knife was made expressly for the operation, "the blade of which, bent on the flat at an angle of forty-five degrees, is triangular in shape, about one and one half lines long, and three fourths of a line broad, sharp at the point, and cutting at both edges." Dr. Prout says: "In doing the operation I proposed to introduce the point through the membrana tympani, a little way from the adhesion, and by a circular sweep of the blade cut round the promontory, so

that I might then remove the piece of adherent membrane. Two days after the operation, the hearing-power for the voice was markedly improved. Three months after the operation the opening still persisted, and the hearing remained improved.

A. H. Buck has communicated the histories of several rare and interesting cases met with in his practice, among which we may name "hook-shaped manubrium mallei," "extravasation of blood into the tissues of the membrana tympani, produced by inflation of the middle ear, according to Politzer's method, and resulting in a perforation of the membrana tympani." A similar case reported by Gottstein (Archiv. für Ohrenheilkunde Bd. IV, p. 71), is referred to by the author. They are very rare.

The other cases are full of interest. "Gunshot-wound in the ear, — removal of the ball after a lapse of nearly ten years," shows how easily the presence of a foreign body in the ear may escape the eye of the hurried surgeon on the field of battle. Dr. Buck removed the ball very easily by means of forceps.

The "arterial hemorrhage from the ear after the removal of a polypoid growth," reminds us of a similar case reported by Moos.

Dr. Blake has given to the profession one of the most valuable papers, because it is statistical. It is from such papers as these that great deductions may be drawn, while the inductive means are being used and constantly employed.

Those parts of Dr. Blake's paper which treat of myringitis, its causes and treatment, are of special interest and worth.

The causes have been shown to be exposure to cold air, or sea-bathing, and the treatment consisted in "free scarification of the membrana tympani, from two to four cuts being made in each case, the points selected for incision being those of greatest prominence or greatest degree of congestion, care being taken not to cut through into the tympanum. Relief was obtained, as a rule, by the one scarification.

The next point of interest in this paper is treatment of the disease known as *otitis media catarrhalis chronica*. The treatment is similar to that of Gruber, and of Politzer, consisting in repeated myringotomy. Blake says the theoretical grounds on which this treatment was instituted, and the reasons for improvement, probably are the diminished resistance to passage of air to the middle ear through the Eustachian tube, the membrana tympani being perforated; and secondly, the irritation consequent upon the repeated incisions resulting in a diminution of the thickening of the membrana tympani.

"In connection with cases of perforation of the membrana tympani, a series of experiments was instituted, with regard to a perception of high musical notes, a summary of which has already been published (Trans. of the American Otological Society, 1872)." The observations on this point are filled with interest, and must also aid in forming a diagnosis of ear disease; for Blake has shown that a concave membrana tympani perceives a higher tone than a less concave one. The same power was developed by voluntary contraction of the tensor tympani muscle. The increased perception of high tones during the passage of the electric current, the cathode being applied in front of the ear, seems to indicate a contraction of the tensor tympani muscle.

Bonnafont, at a meeting of the Academie de Medicine, held July 16th, 1872, demonstrated that the phenomena of taste, etc., produced by irritation of the chorda tympani, and considered by Duchesne and Philipeaux, to be of importance in the diagnosis of the degree of sensibility of the auditory nerve, possessed no real clinical value, and can never be used to determine the degree of sensibility of the auditory nerve, since there is no anatomical connection between the two.

Vulpian has continued his experiments upon the chorda tympani which have had for their object the decision of the question, whether the chorda tympani is to be considered a

centrifugal or a mixed nerve, containing more or less centripetal fibres. The result of the experiments shows that the nerve contains centripetal fibres, which serve as a means of communication for excito-motory irritation, destined to act on the sublingual gland by reflex action. It contains, then, both centripetal and centrifugal fibres, which convey reflex excitation to the gland.

Another series of experiments, confirmed by Prévost of Geneva, shows that part of the chorda tympani accompanies the lingual nerve in its peripheric distribution, furnishing branches to all the terminal filaments of the latter.

We may therefore conclude that the chorda tympani has some influence on the tongue. By experiments, Vulpian showed this to be as follows: The fibres of the chorda tympani which accompany the lingual nerve in its distribution to the tongue, have the same influence on the vessels of that organ, *i. e.* direct dilating influence which the fibres of the chorda tympani possess over the vessels of the submaxillary gland, as already proved by Cl. Bernard.

Vulpian concluded his paper by remarking that the chorda tympani has little sensibility.

Prof. Lucæ reiterates his conviction that certain bodies found in the membranous semicircular canals of man are of a pathological nature, and are peculiar to the adult human being. These are never found in the new-born child, but are produced in some cases by local disturbance, whereas in other cases they are the results of a general systemic disease.

To these bodies Lucæ still applies the name of corpora amylacea, since their starchy nature is said to be proven by the characteristic reaction manifested by them in presence of iodine.

These products, or so-called corpora amylacea, are found in cases of gray degeneration of the spinal cord, typhus, tumor of the brain, tuberculosis, morbus Brightii, peritonitis, chronic ulcer of the stomach, and in cases where a disease of the ear has been present up to the time of death, — as, for example, otitis media. These bodies are not found in

the lower mammals, birds, fishes, or amphibia, by any observer, which is considered additional proof by Lucæ of their pathological nature.

So far as the occurrence of these bodies in the diseases mentioned above is concerned, it may be said, as Rüdinger has already suggested, that it is rather *past hoc* than *propter hoc;* for it is just such diseases which supply material to the anatomist for his investigations; and hence, if they are normally present, these subjects in common with all others should present examples of the so-called corpora amylacea.

Voltolini calls attention to the frequency of a disease among children which he denominates otitis labyrinthica. He describes it as being as frequent and specific as croup. Although the vast majority of these cases are called meningitis cerebro-spinalis, they are really well-marked cases of another disease, viz. otitis labyrinthica, and lack the important features of the above-mentioned fatal malady. Sudden vomiting, with no premonitory symptoms, ushers in the disease, which is attended by no convulsions, paralysis, nor opisthotonos, the mind remains clear, and there is no pain in the head.

The patient complains usually of great subjective roaring in the *head*. This may remit. The head in some cases appears too heavy for the little patient, and it falls over on the shoulders. There is no derangement of the bowels or urine. All the marked symptoms occur within three or four days, and then the patient *recovers entirely*, except the loss of hearing, which is generally total and permanent. In some cases it seems that the child hears music, for the parents say that when the music begins the child begins to dance, — a statement which must generally be accepted with caution. Voltolini has seen only one case of this disease in an adult.

Prof. Rüdinger has contributed an exhaustive paper on the membranous labyrinth, in the last part of Stricker's Hand-Book of Physiology. This paper is divided into six parts. 1. Topographico-histological. 2. Wall of the labyrinth. 3. The vessels of the membranous labyrinth. 4.

Nerves and epithelium of the ampullæ and sacculi. 5. Otoliths. 6. The oval window and its union with the stapes.

The membranous labyrinth is now considered an important part of the perceptive acoustic apparatus. Its topography and histology vary in the different classes of mammals, but in almost all vertebrates the membranous labyrinth is that part of the acoustic apparatus more or less completely closed by a cartilaginous or osseous capsule, with the shape of which it closely corresponds.

The most important statement occurring in the first part of the paper, is, that the sacculus longus, with the ampullæ and semicircular canals, as well as the sacculus rotundus, are in direct contact with the osseous or cartilaginous capsule containing them, and that they do not float, as heretofore supposed, suspended in the perilymph.

The relations between the various parts of the labyrinth are seen in the embryo, in which sections through the petrous bone, at different stages of development, show the interior of the vestibule and semicircular canals to be filled with a gelatinous tissue, which finally assumes a fibrous nature at the walls where at last the various parts of the labyrinth adhere. The periosteum lining the bony labyrinth is a moderately thick layer of connective tissue, containing fine elastic fibres. It is very adherent to the wall, which it covers, and its surface in the semicircular canals is somewhat uneven. It is filled with rather large cells, which become more numerous and less regularly arranged as we approach the free surface. Rüdinger agrees with Henle and Hasse, that this is not epithelium, but a mass of cells belonging to the periosteum. He found the calcareous bodies, mentioned by Kölliker and Henle, in the periosteum of the canals in some individuals, but not invariably.

Of the sacculi, the utriculus is more closely connected to the inner wall of the vestibule than the sacculus rotundus. The two sacculi occupy two thirds of the cavity of the vestibule. The utriculus extends farther outwards towards the tympanum, but neither of them touches the side of the vestibule which receives the base of the stapes.

The membranous semicircular canals are fastened to the convex side of the osseous semicircular canals by means of stout connective tissue-fibres, which are called by the author ligamenta labyrinthi canaliculorum et sacculorum. These constitute the true support of the membranous semicircular canals.

Sometimes there are two or more of these connective tissue stays, so arranged as to simulate under the microscope transverse sections of small canals.

But to these, Rüdinger assigns no special morphological or physiological importance, and they must be regarded simply as part of the supporting apparatus of the membranous labyrinth.

Another set of connective tissue-fibres, which pass from the periosteum to the free surface of the labyrinth-wall, are for the purpose of supporting the blood-vessels as well as furnishing points of fixation for the free wall of the membranous labyrinth. In all the apes and lower mammals the labyrinth is similarly fixed.

In the rat, the major portion of the osseous semicircular canal is filled with a dense net-work of connective tissue, containing pigment-cells, closely imbedded in which lies the eccentric membranous semicircular canal, thus greatly differing from man. The sacculi are fixed, however, just as in man.

In birds, the position of the membranous semicircular canal, according to both Hasse and Rüdinger, is also eccentric. In birds, the ampullae are in contact on all sides with the periosteum of the osseous canal. In the rat, birds, fishes, and short-tailed batrachians, there is no evidence that the cavity which encloses the free surfaces of the membranous semicircular canals and the utriculus, is lined by serous membrane.

In fishes the membranous semicircular canals are fastened to the wall of the relatively wide bony canal, which is filled with a connective tissue net-work containing a series of cavities filled with mucus.

In regard to the labyrinth of the frog, Rüdinger cannot accept the idea of Hasse, that in it we find a serous membrane. In the semicircular canals of the fully developed frog, we find gelatinous tissue similar to that found in the corresponding parts of the human embryo.

The second part of this paper of Prof. Rüdinger is devoted to the wall of the labyrinth. This has an equal thickness, being 0,016-mm. at the point where it touches the periosteum, and thickest at the point of junction with the *Ligamenta labyrinthi canaliculorum*. We can distinguish four layers composing the wall.

1. One of connective tissue.
2. Hyaline tunica propria.
3. Papilliform prominences; and
4. The epithelium.

The external layer possesses all the qualities of connective tissue with numerous cells; there is, however, no pavement-epithelium on the outer surface of the membranous canal. When the entire membranous semicircular canals, removed from their connection with the periosteum and ligaments, are subjected to examination, we find another net-work of fibres, closely resembling nerves and ganglia. Prof. Rüdinger does not say whether these are nervous elements or not. It would be, however, adds the author, of deepest interest were it so, since the existence of nerves in the membranous semicircular canals is as yet doubtful.

The tunica propria is likewise of unequal thickness in the semicircular canals; but in the utriculus it is of uniform as well as great tenuity.

The papilliform prominences, on the inner surface of the tunica propria, are considered by Rüdinger as normal structures in the adult human being.

They are so constant in their occurrence that their absence and *not their presence* is to be considered pathological. They are confined to certain parts of the wall of the canal, are varied in their size and form, and pass imperceptibly into

the tunica propria of which they must be considered a part. They attain their greatest size at the point of insertion of the ligamenta labyrinthi; they are not found on that portion of the tunica propria corresponding to that part of the canal in contact with the bony wall, and are but slightly developed on the free side of the membranous canal.

The papillæ are covered with pavement-epithelium, which is easily detached; and hence the assertion on the part of some observers, that epithelium does not exist at this point. These bodies are not found in the sacculi, nor at that part of the semicircular canals where the latter pass into the utriculus. Although these bodies may not be found in the newborn child, and are considered pathological products by Lucæ and Voltolini, Rüdinger says he has never failed to find them in the adult human being.

Lucæ urges the absence of epithelium, and the reaction between these bodies and iodine, as proof of their starchy nature.

Rüdinger says that epithelium can always be shown to be present with these bodies by the application of the proper tests; and so far as iodine is concerned, that gives the peculiar reaction alluded to in common with the tunica propria and many other tissues in which the presence of starch has *never* been proven.

In conclusion, Rüdinger says their round form can never be adduced as a proof of their amyloid nature, and if the inner surface of the membranous canals possesses a secerning nature, these bodies will supply a larger surface demanded by such a function. These papilliform bodies are not found in the lower mammals.

The fourth part of the paper by Rüdinger consists of a description of the nerves and epitheluim of the ampullæ and sacculi.

As far as the distribution of the acoustic nerve can be traced in the sacculi and ampullæ, we find, on the inner surface of these organs, a constant and peculiar yellowish

epithelium provided with hairs, or cilia. The *crista acustica* is the reduplication and projection of the *tunica propria* extending into the cavity of the ampullæ.

The similar formation in the sacculi is denominated the *macula acustica*. Both names are suggestions of Max Schultze.

Every branch of the acoustic nerve which goes to an ampulla, after dividing into two flat bundles supplied with ganglion-cells, sinks into the furrow which is visible from without, and then passes through the *tunica propria* in order to reach the epithelium of the *crista acustica*.

The thickness of the layer of nerve-epithelium in man stands between that of birds, which is the thinnest, and that of fishes. In connection with this layer of epithelium are the stiff cilia called "acoustic hairs" (Hörhaare), first described by M. Schultze.

In the sacculi, the layer of nerve-epithelium is, on the average, much thinner.

In connection with the acoustic hairs, Rüdinger has described "pale, structureless bodies which occur on the crista acustica and planum semilunare, forming a kind of gelatinous covering for the epithelium and acoustic hairs. These are best seen in fishes of the cyprinoid variety.

The aqueductus vestibuli and canalis reuniens are next considered. The first is regarded by Rüdinger as designed for the reception of veins, as already described by Hyrtl.

The canalis reuniens was first described by Hensen. It is the connecting link between the sacculus rotundus and ductus cochlearis. The otoliths vary in size and shape in different animals. In reptiles and ostracians they attain their largest and handsomest shapes. Some authors claim to have found otoliths, not only in the endolymph of the labyrinth, but also in the serum of the cochlea. Rüdinger is not decided on this point.

In part IV of Stricker's Manual of Physiology, we have Waldeyer's work on the acoustic nerve and the cochlea;

not only in German, but in two English translations, have the members of the profession been made acquainted with the facts contained in this exhaustive paper. It will, however, be fitting to give a short sketch of his labors in this report.

The paper is divided into heads as follows: Comparative Anatomy and History of Development. Capsule of the Cochlea and Membrana Propria of the Ductus Cochlearis. Epithelial Lining of the Ductus Cochlearis. Corti's Organ. The Acoustic Nerve and its Relations to the Organ of Corti. Cochlea of Birds and Amphibians. Comparative Anatomy and Physiology. Corti's Organ and the Retina. Controverted Points. History. Statistical Tables.

The author opens his paper by saying: The cochlea is an attribute of the higher vertebrate classes. The sacculus and ductus cochlearis belong to the cochlea, while the utriculus belongs to the semicircular canals, and these together form the so-called semicircular apparatus (Bogenapparat). The first trace of a ductus cochlearis is found in the cysticula of fishes, as described by Hasse and Breschet.

In amphibians we can distinguish several divisions of the sacculus as forming parts of the cochlea; these, however, are only several thicker portions of the wall of the sacculus, which are provided with special terminal nerve-filaments, as shown by Deiters and Hasse. A still further-developed cochlea is seen in reptiles and birds, and in them we find the first manifestations of a spiral-shaped cochlea, united to the sacculus by the canalis reuniens of Hensen. The canalis reuniens and the ductus cochlearis are lined with a short cylindrical epithelium, but receive no nerve-fibres from the acoustic nerve. It is now for the first time in the history of its development that the cochlea deserves its name, for it is now found wound spirally around the modiolus. The number of the turns in the spiral varies in different species of vertebrates from one half to five turns. It is lowest in the planorbis of the cetaceans, and highest in the Clausilia, or guinea-pig.

Then follows a description of the human cochlea, with its division into scala vestibuli, scala tympani, and the triangular-shaped ductus cochlearis lying between them.

The latter is bounded above by the membrane of Reissner, below, or towards the tympanum, by the membrana basilaris, outwards by a layer of connective tissue rich in vessels. Thus its triangular shape is defined.

Traces of the cochlea are seen in the embryo eight to ten weeks old, near that part which is finally the pars petrosa of the temporal bone. We can then distinguish three varieties of tissue; most external is a cartilaginous mass connected at that time with the cartilaginous base of the skull. Enclosed in this mass is a collection of embryonal mucous tissue, within which, again, is embedded the epithelial labyrinth-vesicle. From the latter, which at last becomes the sacculus, a hollow sprout lined with epithelium, grows before the eighth week, and pushing into the mucous tissue, is forced by the surrounding cartilage to curl itself up into a spiral shape.

At one point the cartilaginous capsule is not closed, and here the cochlear branch of the nervus acusticus enters. In the human embryo of three months, the hollow offshoot manifests the features of the future ductus cochlearis, with all its windings. In embryos of four months, the scalæ, as well as their contents, begin to form.

The next point considered relates to the capsule of the cochlea and the membrana propria of the ductus cochlearis. The bony portion of the capsule is divided into a compact inner layer (tabula vitrea), and the more porous modiolus and lamina spiralis. In the latter we find the canalis ganglionaris, which conceals the spiral ganglion of the acoustic nerve.

The inner surface of the periosteum is covered with a layer of simple, large, flat, nucleated cells, similar to those found on the surface of serous membranes.

The author furthermore states that the investigations of

Schwalbe have proven that the scalæ cochleæ are connected with the arachnoideal cavity of the brain.

The membrane of the round window is composed of two layers, one of mucous membrane from the tympanum, and the other of periosteum from the cochlea. The next points considered under this division of the treatise are, the aqueductus cochlea, membrana Reissneri, and the ligamentum spirale.

The membrane of Reissner receives the most attention, and is said to consist of a thin, connective-tissue basement-lamella, rich in vessels, possessing on its vestibular side large-celled, serous epithelium, and on its tympanal side a single layer of regularly-arranged cubic epithelial cells. The sulcus spiralis externus, crista spiralis, the "acoustic teeth" (Gehörzähne of Huschke) are next considered. The latter are merely projections in the osteogenous substance of the crista spiralis. This subdivision closes with a further consideration of the membrana basilaris and its appearance after the removal of Corti's organ.

The author says: I dare not say whether or not the membrana basilaris possesses a high grade of elasticity; in any event it manifests no great disposition to curl up at its edges; neither is it difficult to pick it apart. The best transverse sections teach us that the membrane is always smooth and tightly stretched between its two points of attachment.

The next portion treats of the epithelial elements of the ductus cochlearis and its masterpiece, the organ of Corti.

The organ of Corti and its important parts, the arches of Corti, the inner and outer series of "hair cells" (Haarzellen), the membrana tectoria, and the membrana reticularis, are considered in turn.

The labors of Hensen, Deiters, Max Schultze, and Boetcher are constantly alluded to and often quoted *in extenso*. The so-called Corti's cells are acknowledged by the author to belong to the structures in the cochlea most difficult to examine. He adheres to the description already given by Gottstein (Innsbrucker Naturforscher-Versammlung, 1869).

The so-called hair-cells (Haarzellen) are evidently objects of the greatest interest to the writer, and to them he has turned his most observant attention.

He says in conclusion: If we leave the various peculiarities of the inner hair-cells out of consideration, the apparently complicated structure of Corti's organ reveals really a simple plan. It may be thus described: Several rows of cylinder-cells are arranged behind each other in a regular order upon a broad zone of the spiral membrane, and are kept in their position by two membranous boundaries, the lamina reticularis, and the striped layer of the membrana basilaris. The inner hair-cells differ from the outer hair-cells in not being double cells, and are also less numerous than the outer hair-cells. The number of the inner arches is also less than that of the outer ones. These cells, with Corti's organ, are the exclusive peculiarity of the cochlea of man and mammals. The hair-cells are of great importance in connection with the terminal portions of the acoustic nerve, for to these cells the nerve-fibres are distributed.

The next division refers to the acoustic nerve and its relations to Corti's organ. The author adheres to the description of the origin of this nerve as given by Stieda. It arises by two roots from the medulla oblongata. The fibres of the acoustic nerve are distributed to the cochlea by means of the ramus cochlearis. To this branch of the acoustic nerve the author has devoted his attention. The ultimate fibres as they reach the cochlea are distributed to the inner and outer hair-cells, and are hence called the inner and outer terminal nerve-fibres.

Their name indicates their manner of distribution. Gottstein was the first one to trace the outer fibres to their ultimate distribution to the inner row of the outer hair-cells. Waldeyer is unable to say whether the outer rows receive filaments of nerves or not, but is inclined to the opinion that they do, since we often see several nerve-fibres pass together between the pillars of the arches, and it is fair to presume that they are on their way to the remoter hair-cells.

In alluding to the spiral tracts of the cochlea, the author says they belong to the most delicate structures known to the histologist, and they are probably of nervous origin.

They were first described by Max Schultze, and although their origin is involved in obscurity, the author inclines to the view that they are among the most important elements of the cochlea.

The simple structures of the cochlea of birds is next considered, in which the "dentate cells" (Zahnzellen) of Hasse are alluded to, and that author's opinion that these cells contribute to the formation of the membrana tectoria is accepted by Waldeyer.

The "Stäbchen-Zellen" of Deiters, Hasse, and Leydig are not accepted by Waldeyer. He calls them ciliate cells (Haarzellen). Only in pigeons has Waldeyer found nerve-fibres in connection with these ciliate cells (Haarzellen), while Hasse has found them in fishes as well as in birds; the latter, also, claims a similar structure for the cochlea of frogs. Under the head of "Remarks on the Comparative Anatomy and Physiology of these Parts," the author says the anatomical facts point with certainty to the great fact that the (Haarzellen) ciliate cells are the most important part of the cochlear apparatus. We must also bear in mind that the ciliate cells of amphibious reptiles and birds resemble more closely the inner ciliate cells of mammals, in which, in the structures of the Corti's arches and outer ciliate cells, we meet something new. Corti's organ must be considered as a supporting apparatus for the ciliate cells.

Waldeyer considers the functions of the membrana tectoria and the otoliths as a muffling, or damper-apparatus. The final part of this paper is devoted to a comparison between Corti's organ and the retina.

I. A. Nussbaumer, a medical student in Vienna, has communicated some very interesting facts relating to subjective perceptions of color produced in himself by objective perception of sound. He states that his brother has the

same peculiarity; but the same objective sound produces different subjective impressions of color in each.

The note "small e" on the piano produces in the former the color of dark yellow; in the latter, the subjective impression of color is dark-blue. There are some colors which no note ever calls up; blue and yellow, brown and violet, are the colors most frequently produced. There is no red nor green, nor perfect black and white, in any notes. Nussbaumer, however, perceived *green* upon hearing suddenly a peculiar noise. Colors are also perceived by him in dreams if noises occur.

The author at last endeavored to represent the picture of the fundamental note as a mixture of single pictures, corresponding to the separate partial tones, and he was in a measure successful.

James Hinton has contributed a paper on Ménière's disease, containing an account of nine cases of this, as yet, obscure affection. In one case a perturbed perception of musical notes was a marked symptom, "g" of the third octave being heard twelve notes lower, or as "c" of the octave below. The note most distinctly heard was "g^{iv}."

In this paper the author states that the "disease which most frequently produces permanent abolition of hearing, without apparent affection of the tympanum, is mumps. Unfortunately, dissection has thrown little light upon its pathology."

"For the most part, the tympanum in these cases appears perfectly healthy, and the loss of hearing is the only symptom at all connected with the ear. Then follow two cases, reported by the author, in which an affection of the middle ear appears to have been present with the mumps. "The prognosis, as regards the recovery of the hearing, is in the last degree unfavorable, and this seems to be the experience of all who have written on the subject. But there seem to be some other cases which suggest that these affections may exist in various degrees of intensity, and that probably the cases which have hitherto attracted attention are the

residuum, as it were, of a much larger number, less severe, and escaping observation through taking a favorable course."

There are several interesting conclusions to be drawn from the statements made in this interesting paper.

1. It appears that in some instances the hearing power is worse at the time of the paroxysms of giddiness and vomiting. In others, the hearing power is at once impaired, and remains so, or is observed gradually to improve.

2. All the marked and serious symptoms may be present, and yet recovery finally occur.

3. Tinnitus in these cases may be due to muscular spasm, either in the tensor tympani, or, as the author suggests, in the stapedius muscle. This latter statement may be very attractively connected with a very interesting and scientific paper by Dr. Brunner, of Zurich, which I shall allude to now.

Brunner has contributed an interesting and analytical treatise on the symptoms produced in the auditory apparatus, by the discharge of fire-arms in its vicinity, and upon tinnitus aurium in general.

He states that there is a *constant* aërial communication between the tympanum and the pharynx, independent of the act of deglutition, by means of the so-called safety-tube (Sicherheitsröhre) of Rüdinger. This allows of a ready recoil of the membrana tympani in cases of sudden concussion. The feeling of fulness experienced by the discharge of fire-arms near the ear, as well as the subjective noises, are produced, according to his views, by a reflex spasm of the tensor tympani, accompanied by an excess of irritation of the acoustic nerve. The pitch of the notes heard in tinnitus aurium is high in the scale, and is due to the increased tension of the membrana tympani and its consequently greater susceptibility to respond to high notes; or, as Hinton calls them, "harmonics usually inaudible to the ear." They may be considered as emanating from objective sources, according to Brunner; but Hinton has suggested no explanation on account of this increased susceptibility for high notes; the

high partial tones are heard better than the lower fundamental note, both of an instrument and the voice.

A most interesting addition to the pathology of the acoustic nerve has been given by Prof. Bertcher, of Dorpat. The paper treats of fibro-sarcoma of the acoustic nerve, and the author has shown that, whereas tumors of this nerve have usually been classified under the head of neuromata of the acoustic nerve, in this morbid growth, the features most apparent were not of a nature to indicate a nervous origin, but the mass was distinctly fibrous in its character.

The author says: "The definite outlines of the axis-cylinders were entirely wanting, the presence of which alone would justify us in calling it a neuroma."

Dr. Blake gives the following summary of conditions under which the constant electric current may be used as a means of diagnosis. They are: chronic catarrh of the middle ear, both of long and short duration; deafness, occurring during pregnancy, child-bed, at puberty, from mental disturbance, bodily exhaustion, and accident; deaf-mutism, acquired or congenital. In many cases it is not possible to establish a formula for the reaction of the auditory nerve, and in many cases no formula whatever can be obtained, although the necessary conditions with regard to a successful application are fulfilled. Blake then proposes to supplement the practical value of Brenner's discovery, by testing the effects the current has upon the perceptive power of the acoustic nerve. In such cases, where Brenner's plan has failed to be of practical value, Blake has suggested a plan of testing whereby he has found that the perceptions for high musical tones increased from three to five thousand vibrations per second above the highest limit of hearing before the application of the current. This increase in perception is continued during the passage of the current, and for a short time after opening the cathode, but is speedily diminished by a reversal of the current and the application of the anode. Another conclusion, drawn by Blake from his experiments on this topic, is the following: When the cathode is applied in front of

the ear, as in one of his experiments, we find that the passage of the galvanic current increases not only the limit of perception of musical tones, but also the intensity of perception, the degree of increase in intensity of perception being a measure of the degree in which the auditory nerve responds to the stimulus.

A still further conclusion, drawn by Dr. Blake from his experiments, is the following: —

It will be found as a rule, that the current which diminishes the tinnitus aurium increases the hearing, and the current which increases the tinnitus, diminishes the hearing. In cases where the tinnitus is diminished without increase of hearing, this effect is usually produced by the use of the anode, the cathode increasing the tinnitus, without a corresponding increase of hearing. When the hearing is increased, together with an increase of the tinnitus, this result is usually obtained with the use of the cathode.

If the improvement in hearing, and an attendant diminution of tinnitus, cannot be effected by the use of the same pole, Blake advises the use of that pole which improves the hearing, although it increase the tinnitus, for the latter will usually be but temporary.

Blake's modified Kœnig's rods have been used in these experiments for testing the increase in the perceptive power of the auditory nerve.

In ordinary practice the author advises the use of a battery without the intervention of Rheostat, if the latter instrument is not at hand, applying one electrode before the ear and the other in the hand of the opposite side of the patient.

W. B. Neftel has investigated more closely the abnormal galvanic reaction of the acoustic nerve in chlorosis and Bright's disease.

The cause of the abnormal reaction in the acoustic nerve of chloroties is due to a tendency towards a rupture of the blood-vessels in the auditory apparatus. An abnormal reaction of the acoustic nerve has been also found in two cases of constitutional syphilis, with affections of the brain. No

reasons are assigned by the author for this abnormal reaction of the acoustic nerve in constitutional syphilis; but in Bright's disease, he thinks it may be due to hemorrhages into the labyrinth.

From Brussels, we have a work containing one hundred pages on Tinnitus Aurium, by Delstanche, fils, divided into chapters as follows: Introduction, Etiology, — divided into six subdivisions, — Diagnosis and Treatment. Then follow some conclusions.

The chapter on treatment of this distressing symptom is very copious in its data, containing nearly all the views on the subject.

The work claims no great amount of originality, but surely is an excellent compendium of all that is known on this subject.

Prof. Moos has written a very interesting paper upon the "significance of the higher musical notes, based upon pathological observations." The paper contains the histories of seven cases which furnish data for the conclusions drawn by the author. Among these cases there are three of Ménière's disease, and one case of each of the following diseases: cerebro-spinal meningitis, hemorrhage into the labyrinth, meningitis, and concussion occurring in a man afflicted with rheumatic and syphilitic poison. Moos concludes his paper with the following words: "In considering the facts observed in the first four cases, we find that, upon the whole, they correspond with our knowledge of the significance of the higher musical tones in relation to the perception of speech. . . . The higher tones appear of greater importance for the understanding of speech than the lower ones. This observation corresponds with the physiological facts as regards the pitch of the single vowels and consonants, of which the human speech is composed. (Helmholtz and Wolf.) Aside from their diagnostic value, the cases reported in this paper are of interest to the aurist in regard to prognosis. In many cases of so-called nervous affections of the ear, the question as to whether the patient perceives

the higher musical tones distinctly, faintly, or not at all, may furnish us with a clew as to the probable degree of recovery of hearing."

Your committee would state, in this connection, that a case of deafness for low notes has recently come under his notice. The young lady who was the patient was not at all deaf for the sounds of the human voice, but was made aware of deafness for *low* notes by a curious occurrence. She was walking in the field with her father when a thunder-storm was approaching. Her father could hear the thunder, but she was unable to hear it. She also failed to distinguish the bass notes of the organ.

J. J. Müller, in a paper on the notes perceived in tinnitus aurium, makes the following conclusions: In general a compound perception will arise from the fundamental note, and the overtones of a simple objective vibration, although the former may not be recognized as such.

The author therefore endeavors to find an evident analogy between this fact and the theory of the distinction of colors, as explained by Young and Helmholtz, in so far as according to the latter, each mode of æthereal vibration excites a perception of those fundamental colors.

Clarke and Amory, in their valuable work on the "Physiological and Therapeutical action of Bromide of Potassium and some kindred Salts," have shown that the hearing is unaffected by bromides.

The subject of deaf-mutism and the education of the deaf and dumb by means of lip-reading and articulate speech, has claimed the attention of aurists, both in England and America, during the past year. Drs. Dalby,[1] of London, Turnbull,[2] and Burnett,[3] of Philadelphia, have written papers calling attention to this very important topic.

We record with pleasure the regular appearance of the

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[1] Education of the deaf and dumb by means of lip-reading and articulation. London, 1872.

[2] Phila. Med. and Surgical Reporter. December 1872.

[3] Phila. Medical Times. Sept. 2, 1872.

"Monatsschrift für Ohrenheilkunde," in Berlin, the "Archiv für Ohrenheilkunde," in Leipzig, and the "Archives of Ophthalmology and Otology," published every six months, simultaneously in Carlsruhe and New York.

In the recent issue of the last-mentioned periodical, Dr. Knapp has described an ingenious operation for cleft lobule of the auricle, as well as a new method of recording the hearing power.

The latter is a modification of one already devised and described by Dr. Prout (Boston Med. and Surg. Journal, Febuary 1872).

These few sketches of the contributions to Otology, gathered from the various branches of science, relating to our specialty, serve to demonstrate the growing importance of the subject, as well as the frequency of ear diseases and the many channels which lead to a rational and successful treatment of them.

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